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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/787,502

03/16/2001

Kazuyuki Tadatomo

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CHICAGO, IL 60601-6780

EXAMINER
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ORTIZ, EDGARDO

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 07/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/787,502

Applicant(s)

Tadatomo Et.al.

Examiner

Edgardo Ortiz

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on Mar 25, 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 2-12 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some\* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 5 6) ☐ Other:

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### DETAILED ACTION

This Office Action is in response to an amendment filed March 25, 2002 on which Applicant amended claims 2 and 8 and canceled claim 1.

#### *Claim Objections*

1. Claims 6 and 8 are objected to because of the following informalities: On claim 6, line 3, instead of "which element comprising" the claim should read "wherein an element comprising". On claim 8, line 6, instead of "which element comprising" the claim should read "wherein an element comprising". Appropriate correction is required.

#### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8, 10 and 11 are rejected under 35 U.S.C. § 102 (b) as being anticipated by Manabe et. al. (U.S. Patent No. 5,408,120). With regard to Claim 8, Manabe teaches a semiconductor light receiving element comprising a light receiving layer (5) comprising a GaN group semiconductor and an electrode (7) including a Ni undercoat (13) formed on one surface of the light receiving layer as a light receiving surface in such a manner that the light can enter the light receiving layer,

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wherein the light receiving element is a photoconductive type light receiving element, the light receiving layer is a first conductivity type I layer, and the electrode formed on the light receiving surface is an ohmic electrode of one polarity, wherein an element comprising an ohmic electrode (8) of the other polarity formed on the other surface of the light receiving layer directly or via a first conductivity type and low resistance GaN group semiconductor layer.

With regard to Claim 10, Manabe teaches an ohmic electrode (7) of one polarity that is an opaque electrode (aluminum) and the light receiving surface has an area covered with the electrode and an incident area not covered with the electrode to permit entry of light.

With regard to Claim 11, Manabe teaches an ohmic electrode (8) of the other polarity that is formed via a first conductivity type and low resistance GaN group semiconductor layer (3), the low resistance GaN group semiconductor layer and the light receiving layer (5) are successively formed on a crystal substrate (1), an upper surface of the low resistance GaN group semiconductor layer is partially exposed, and the ohmic electrode of the other polarity is formed on this exposed surface.

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***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-7 are rejected under 35 U.S.C. § 103 (a) as being unpatentable over Khan et.al. (U.S. Patent No. 4,614,961) in view of Nozaki (Japanese Patent No. 61-008979). With regard to Claim 2, Khan teaches a semiconductor light receiving element comprising a light receiving layer comprising a GaN group semiconductor (14) and an electrode (15) formed on one surface of the light receiving layer as a light receiving surface in such a manner that the light can enter the light receiving layer, wherein the light receiving element is a Schottky barrier type light receiving element, said light receiving layer is a first conductivity type layer (n-type), said electrode formed on said light receiving surface comprises at least a Schottky electrode (metal Schottky barrier).

However, Khan fails to teach a total of boundary lines between areas of the light receiving surface covered with the Schottky electrode and exposed areas, is longer than the length of the outer periphery of the light receiving surface. Nozaki teaches a photoelectric device including a grid-shaped electrode (15) formed through a transparent conducting film (14), the grid-shaped electrode and the transparent conducting film having a total of boundary lines between areas of

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the transparent conducting film covered with the grid-shaped electrode and exposed areas that is longer than the length of the outer periphery of the light receiving surface. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Khan to include a total of boundary lines between areas of the light receiving surface covered with the Schottky electrode and exposed areas, is longer than the length of the outer periphery of the light receiving surface, as suggested by Nozaki, in order to optimize the area needed to receive light and minimize the outer periphery.

With regard to Claim 3, a further difference the claimed invention and Khan is, the Schottky electrode having a wiring pattern formed by strip conductors in combination. Nozaki teaches a photoelectric device including a grid-shaped electrode (15) formed through a transparent conducting film (14), the grid-shaped electrode having a wiring pattern comprising strip conductors. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Khan to include Schottky electrode having a wiring pattern formed by strip conductors in combination, as suggested by Nozaki, in order to permit light to enter the light receiving layer more efficiently.

With regard to Claim 4, a further difference the claimed invention and Khan is, the thickness of the strip conductors. It would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Khan to include strip

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conductors with the claimed thickness, so that the thickness allows for strip conductors which permit light to enter the light receiving layer more efficiently.

With regard to Claim 5, a further difference the claimed invention and Khan is, a wiring pattern having a comblike pattern. Nozaki teaches a photoelectric device including a grid-shaped electrode (15) formed through a transparent conducting film (14), the grid-shaped electrode having a wiring pattern comprising strip conductors in a comblike arrangement. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Khan to include a wiring pattern having a comblike pattern, as suggested by Nozaki, in order to provide strip conductors arranged in a way that permits light to enter the light receiving layer more efficiently.

With regard to Claim 6, Khan teaches a light receiving layer (14) that is an uppermost layer of a laminate comprising one or more layer comprising a first conductivity type GaN group semiconductor formed on a crystal substrate (11) and an ohmic electrode (16) formed on the light receiving layer. However, Khan fails to teach an ohmic electrode formed on a layer other than the light receiving layer. Nozaki teaches a substrate having a grid-shaped electrode (15) formed through a transparent conducting film (14) and an ohmic electrode (11) formed on a layer (11) other than the transparent conducting film. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as

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taught by Khan to include an ohmic electrode formed on a layer other than the light receiving layer, as suggested by Nozaki, in order to provide an ohmic electrode with low contact resistance and which facilitates tunnel current flow.

With regard to Claim 7, Khan teaches a crystal substrate (11) that is made from a conductive material and an ohmic electrode (16). However, Khan fails to teach the ohmic electrode formed on the crystal substrate. Nozaki teaches a substrate having a grid-shaped electrode (15) formed through a transparent conducting film (14) and an ohmic electrode (11) formed on a substrate (11) other than the transparent conducting film. Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Khan to include an ohmic electrode formed on the crystal substrate, as suggested by Nozaki, in order to provide a substrate with an ohmic electrode with low contact resistance and which facilitates tunnel current flow.

Claim 9 is rejected under 35 U.S.C. § 103 (a) as being unpatentable over Manabe et.al. (U.S. Patent No. 5,408,120) in view of Berger et.al. (U.S. Patent No. 5,777,390). Manabe, as stated supra, essentially discloses the claimed invention but fails to teach, the ohmic electrode of one polarity being a transparent electrode. Berger teaches a photodiode which can include opaque electrodes (19) or transparent electrodes, as needed, wherein the transparent electrodes are overlaid with gold to enhance speed and conductivity. Therefore, it would have been an obvious



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modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Manabe to include ohmic electrode of one polarity being a transparent electrode, as suggested by Berger, in order to provide an electrode which enhances speed and conductivity and permits entry of light.

Claim 12 is rejected under 35 U.S.C. § 103 (a) as being unpatentable over Manabe et.al. (U.S. Patent No. 5,408,120) in view of Nozaki (Japanese Patent No. 61-008979). With regard to Claim 12, Manabe teaches a crystal substrate (1) that is a sapphire crystal substrate, a low resistance GaN group semiconductor layer (3) that is an n<sup>+</sup>-GaN group semiconductor layer, a light receiving layer (5) that is an n - GaN semiconductor layer and an ohmic electrode (7) including a Ni undercoat (13) formed on one surface of the light receiving layer. Nozaki teaches a photoelectric device including a grid-shaped electrode (15) formed through a transparent conducting film (14). Therefore, it would have been an obvious modification to someone with ordinary skill in the art, at the time of the invention, to modify the structure as taught by Manabe to include an ohmic electrode having a comblike pattern, as suggested by Nozaki, in order to provide strip conductors arranged in a way that permits light to enter the light receiving layer more efficiently.

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***Response to Arguments***

4. Applicant's arguments with respect to claims 1-12 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Edgardo Ortiz (Art Unit 2815), whose telephone number is (703) 308-6183 or by fax at (703) 308-7724. In case the Examiner can not be reached through a direct telephone call, you might call Supervisor Eddie Lee at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application should be directed to the Group 2800 receptionist whose telephone number is (703) 308-0956.

EO / AU 2815

6/28/02



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